

# WHAT IS CLAIMED IS:

1                   1.     A method for inspecting electronic components mounted on a  
2     printed circuit board with a mounting substance, each of the components including  
3     leads, endcaps or other interconnects, the method comprising:  
4                   imaging the components and the mounting substance on the printed  
5     circuit board to obtain 3-D and 2-D data associated with the components and material  
6     surrounding the components; and  
7                   processing the 3-D and 2-D data in combination to find the locations  
8     of the components based on identified leads, endcaps, or other attributes as  
9     differentiated from the mounting substance, circuit board and other material on which  
10    the components are placed.

1                   2.     The method as claimed in claim 1 wherein the mounting  
2     substance is solder paste.

1                   3.     The method as claimed in claim 1 wherein the mounting  
2     substance is an adhesive.

1                   4.     The method as claimed in claim 3 wherein the adhesive is a  
2     glue.

1                   5.     The method as claimed in claim 1 wherein the leads have feet  
2     and wherein the step of processing includes the step of calculating centroids of the  
3     feet.

1                   6.     The method as claimed in claim 1 wherein the leads have feet  
2     and wherein the step of processing includes the step of calculating average height of  
3     the feet.

1                   7.     The method as claimed in claim 1 wherein the step of  
2     processing includes the step of calculating border violation percentage of the  
3     mounting substance.

1                   8.     The method as claimed in claim 1 wherein the step of  
2     processing includes the step of pruning the board.

1                   9.     The method as claimed in claim 1 wherein the step of  
2     processing includes the step of pruning the leads from the mounting substance.

1                   10.    The method as claimed in claim 1 wherein the step of  
2     processing includes the step of processing the 3-D data together with upper and lower  
3     threshold values to find the locations of the leads and the mounting substance.

1                   11.    A system for inspecting electronic components mounted on a  
2     printed circuit board with a mounting substance, each of the components including  
3     leads, endcaps or other interconnects, the system comprising:

4                         a 3-D scanner for imaging the components and the mounting substance  
5     on the printed circuit board to obtain 3-D and 2-D data associated with the  
6     components and material surrounding the components; and

7                         a high-speed image processor for processing the 3-D data to find the  
8     locations of the leads and the mounting substance and for processing the 2-D data  
9     together with the locations of the leads and the mounting substance to distinguish the  
10    leads from the mounting substance.

1                   12.    The system as claimed in claim 11 wherein the mounting  
2     substance is solder paste.

1                   13.    The system as claimed in claim 11 wherein the mounting  
2     substance is an adhesive.

1                   14.    The system as claimed in claim 13 wherein the adhesive is a  
2     glue.

1                   15.    The system as claimed in claim 11 wherein the leads have feet  
2     and wherein the high speed image processor also calculates centroids of the feet.

1                   16.    The system as claimed in claim 11 wherein the leads have feet  
2   and wherein the high speed image processor also calculates average height of the  
3   feet.

1                   17.    The system as claimed in claim 11 wherein the high speed  
2   image processor also calculates border violation percentage of the mounting  
3   substance.

1                   18.    The system as claimed in claim 11 wherein the high speed  
2   image processor also prunes the board.

1                   19.    The system as claimed in claim 11 wherein the high speed  
2   image processor also prunes the leads from the mounting substance.

1                   20.    The system as claimed in claim 11 wherein the high speed  
2   image processor processes the 3-D data with the upper and lower threshold values  
3   to find the locations of the leads and the mounting substance.

1                   21.    A method for inspecting electronic components mounted on a  
2   printed circuit board with a mounting substance, each of the components including  
3   a body and endcaps, the method comprising:  
4                    imaging the components and material surrounding the components to  
5   obtain 3-D and 2-D;  
6                    processing the 2-D and 3-D data to find locations of the endcaps; and  
7                    further processing with the 2-D data to isolate the endcaps from their  
8   bodies.